

WHAT IS CLAIMED IS:

1 1. A system for increasing overall fuel efficiency of a facility comprising:
2 a gas expansion engine for receiving a supply of pressurized gas, said
3 expansion engine having a rotatable shaft as an energy output; and, an electric
4 generator coupled to said rotatable shaft of said expansion engine for the
5 purposes of generating electricity.

1 2. The system of Claim 1 further including a source of heat used to preheat
2 the supply of pressurized gas.

1 3. The system of Claim 2 wherein the source of heat comes from recovered
2 waste heat from reciprocating engine(s) driving at least one secondary electric generator.

1 4. The system of Claim 2 wherein the source of heat comes from recovered
2 waste heat from gas fired turbine engine(s) driving at least one secondary electric
3 generator.

1 5. The system of Claim 2 wherein the source waste heat comes from
2 recovered waste heat from a plant's process via a heat exchanger.

1 6. The system of Claim 2 wherein the source of heat comes from a boiler
2 feed water condenser.

1 7. The system of Claim 2 wherein the source of heat is recovered waste heat
2 from flue gas from one or more pieces of fired process equipment.

1 8. The system of claim 1 wherein the gas expansion engine is a piston type
2 expansion engine.

1 9. The system of claim 1 wherein the gas expansion engine is a turbo
2 expander type expansion engine.

1 10. A preassembled composite system comprising:
2 a gas expansion engine for receiving a supply of pressurized gas, said
3 expansion engine having a rotatable shaft as an energy output;
4 an electric generator coupled to said rotatable shaft of said expansion
5 engine; and
6 a skid on which the gas expansion engine and the electric generator are
7 mounted.

1 11. A preassembled composite system comprising:
2 a gas expansion engine for receiving a supply of pressurized gas, said
3 expansion engine having a rotatable shaft as an energy output;
4 a machine having a mechanical drive coupled to said rotatable shaft of
5 said expansion engine; and
6 a skid on which the gas expansion engine and machine are mounted.

1 12. A system for increasing overall fuel efficiency comprising:
2 a gas expansion engine for receiving a supply of pressurized gas, said gas
3 expansion engine having a rotatable shaft as an energy output;
4 an electric generator coupled to said rotatable shaft of said expander
5 engine; and a municipality gas distribution network for distributing at least a
6 portion of tail gas from the gas expansion engine.

1 13. The system of Claim 12 wherein the gas distribution network is a
2 distribution system located downstream of a pressurized municipality gas supply gate.

1 14. The system of Claim 12 wherein the expansion engine and the electric
2 generator are preassembled and installed as a single unit.

1 15. A system for increasing overall fuel efficiency of an electric power generating
2 plant comprising:

3 a gas expansion engine for receiving a supply of pressurized gas, said expansion
4 engine having a rotatable shaft as an energy output;
5 a first electric generator coupled to said rotatable shaft of said expansion engine;
6 at least one boiler supplied with at least a portion of fuel gas that has been
7 lowered in pressure by running the supply of pressurized gas through the gas
8 expansion engine; and a second generator driven by a steam turbine using steam from
9 said at least one boiler.

1 16. The system of Claim 15 wherein the expansion engine and the first electric
2 generator are preassembled as a single unit and installed as a single unit.

1 17. The system of claim 15 wherein the gas expansion engine and electric
2 generator are mounted on a skid for reduced installation time.

1 18. A system for increasing overall fuel efficiency of an ice-making facility
2 comprising:

3 a gas expansion engine for receiving a supply of pressurized gas of a first
4 pressure and first temperature, said expansion engine having a rotatable shaft as
5 an energy output, said expander outputting a tail gas having a second lower
6 temperature and second lower pressure;

7 at least one electric generator coupled to said rotatable shaft of said expansion
8 engine;

9 an ice-making apparatus; and

10 at least one heat exchanger for transmitting coldness from the tail gas of the
11 expansion engine to the ice-making apparatus.

1 19. The system of claim 18 wherein the gas expansion engine and first electric
2 generator are preassembled as a single unit and installed as a single unit.

1 20. A system for increasing overall fuel efficiency of an ice-making facility
2 comprising:
3 a gas expansion engine for receiving a supply of pressurized gas of a first pressure
4 and first temperature, said expansion engine having a rotatable shaft as an energy
5 output, said expansion engine outputting a tail gas having a second lower temperature
6 and second lower pressure;
7 at least one pump coupled to said rotatable shaft of said gas expansion engine;
8 an ice-making apparatus; and
9 at least one heat exchanger for transmitting coldness from the tail gas of the
10 gas expansion engine to the ice-making apparatus.

1 21. A system for increasing overall fuel efficiency of an HVAC system
2 comprising:
3 a gas expansion engine for receiving a supply of pressurized gas of a first
4 pressure and first temperature, said expansion engine having a rotatable shaft as an
5 energy output, said expansion engine outputting a tail gas having a second lower
6 temperature and second lower pressure;
7 at least one electric generator coupled to said rotatable shaft of said gas
8 expansion engine;
9 an HVAC apparatus; and
10 at least one heat exchanger for transmitting coldness from the tail gas of the
11 gas expansion engine to the HVAC apparatus.

1 22. The system of claim 21 wherein a gas expansion engine and electric
2 generator are preassembled as a single unit and installed as a single unit.

1 23. The system of claim 21 wherein the gas expansion engine and the
2 generator are mounted on a skid for reduced installation time.

1 24. A system for increasing overall fuel efficiency of an HVAC system
2 comprising:
3 a gas expansion engine for receiving a supply of pressurized gas of a first
4 pressure and first temperature, said expansion engine having a rotatable shaft as an
5 energy output, said expansion engine outputting a tail gas having a second lower
6 temperature and second lower pressure;
7 at least one compressor coupled to said rotatable shaft of said expansion
8 engine;
9 an HVAC apparatus; and
10 at least one heat exchanger for transmitting coldness from the tail gas of the
11 expansion engine to the HVAC apparatus.

1 25. The system of Claim 24 wherein the gas expansion engine and compressor
2 are preassembled as a single unit and installed as a single unit.

1 26. The system of claim 24 wherein the gas expansion engine and the
2 compressor are mounted on a skid for reduced installation time.

1 27. A method of increasing fuel efficiency comprising:
2 providing a supply of pressurized gas to the inlet of a gas expansion engine;
3 directing at least a portion of lower pressure gas from the outlet of the gas
4 expansion engine to a gas consuming device;
5 generating a rotational force as an energy output from said gas expansion engine;
6 coupling said rotational force to an electric generator; and
7 generating electric power using said electrical generator.

1 28. The method of claim 27 further comprising:
2 preheating the supply of pressurized gas.

1 29. The method of claim 27 further including the steps of:
2 using at least a portion of the lower pressure gas from the outlet of the gas
3 expansion engine as fuel for an engine driving a second generator.

1 30. The method of claim 27 further including the step of using at least a
2 portion of the lower pressure gas from the outlet of the gas expansion engine as fuel for
3 a boiler.

1 31. A method of increasing fuel efficiency comprising:
2 providing a supply of pressurized gas to the inlet of a gas expansion
3 engine;
4 directing at least a portion of lower pressure gas from the outlet of the gas expansion
5 engine to a gas distribution network for a municipality.

1 32. A method of increasing fuel efficiency comprising:
2 providing a supply of pressurized gas having a first pressure and first
3 temperature to the inlet of a gas expansion engine;
4 directing at least a portion of the outlet gas for the outlet of the gas
5 expansion engine to a heat exchanger; and
6 extracting coolness in the heat exchanger from the outlet gas having a
7 lower second temperature.

1 33. The method of increasing fuel efficiency of claim 32 further comprising
2 the step of:
3 using the coolness extracted from the outlet gas for an HVAC cooling device.

1 34. The method of increasing fuel efficiency of claim 33 further comprising
2 the step of:
3 using the coolness extracted from the outlet gas in an ice making process.

1 35. The method of increasing fuel efficiency of claim 33 further comprising
2 the step of:
3 using the coolness extracted from the outlet gas for cooling an industrial process.